

KSC-SPEC-F-0009A

October 14, 1988

Supersedes
KSC-SPEC-F-0009
June 1, 1976

**DESIGN, FABRICATION, AND ERECTION OF SIGNS
AT JOHN F. KENNEDY SPACE CENTER
SPECIFICATION FOR**

ENGINEERING DEVELOPMENT DIRECTORATE

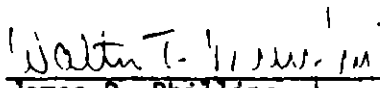
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Approved:



for James D. Phillips
Director of Engineering Development

JOHN F. KENNEDY SPACE CENTER

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JOHN F. KENNEDY SPACE CENTER, NASA
DESIGN, FABRICATION, AND ERECTION OF SIGNS
AT
JOHN F. KENNEDY SPACE CENTER
SPECIFICATION FOR

This specification has been approved by the Engineering Development Directorate of the John F. Kennedy Space Center (KSC) and is mandatory for use by KSC and associated contractors.

1. SCOPE

This specification describes the requirements for the design, fabrication, and erection of signs, as defined in this document, at John F. Kennedy Space Center, Florida. The specification does not apply to signs at Cape Canaveral Air Force Station, Eastern Test Range, Spaceport USA.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

Federal

L-S-300 Sheeting and Tape, Reflective; Nonexposed Lens

Military

MIL-A-8625 Anodic Coatings, for Aluminum and Aluminum Alloys

2.1.2 Standards.

John F. Kennedy Space Center.

KSC-STD-C-0001 Protective Coatings of Carbon Steel, Stainless Steel and Aluminum on Launch Structures and Ground Support Equipment, Standard for

Federal

595 Colors

2.1.3 Kennedy Management Issuances.

KHB 1200.1A, Section 13 Signs

(Copies of specifications and standards may be obtained from the KSC Library, Specifications and Standards Section.)

2.2 Non-Governmental

2.2.1 American Society for Testing and Materials.

| | |
|-----------|---------------------------------------------------------------------------------------------|
| ASTM A446 | Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality |
| ASTM A525 | General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process |
| ASTM A615 | Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| ASTM B26 | Aluminum-Alloy Sand Castings |
| ASTM B209 | Aluminum and Aluminum-Alloy Sheet and Plate |
| ASTM B210 | Aluminum-Alloy Drawn Seamless Tubes |
| ASTM B211 | Aluminum-Alloy Bars, Rods, and Wire |
| ASTM B221 | Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes |
| ASTM B308 | Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded |

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103)

American Concrete Institute

| | |
|---------|----------------------------------------------------|
| ACI 318 | Building Code Requirements for Reinforced Concrete |
|---------|----------------------------------------------------|

(Application for copies should be made to the American Concrete Institute, Post Office Box 19150, Detroit, MI 48219).

American Institute of Steel Construction

| | |
|-------------|------------------------------|
| 8th Edition | Manual of Steel Construction |
|-------------|------------------------------|

(Application for copies should be addressed to the American Institute of Steel Construction, Inc., 400 N. Michigan Ave., Chicago, IL 60611)

U.S. Department of Transportation, Federal Highway AdministrationD6.1 Manual on Uniform Traffic Control Devices for
Streets and Highways

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402).

3. REQUIREMENTS

3.1 General.

- a. See KHB 1200.1A, Section 13, for policy and approval authority required for signs at KSC.
- b. Signs erected at KSC shall be limited to those described below unless a waiver is granted through the chain of responsibility established in KHB 1200.1A, Section 13.
- c. All signs shall have small radian corners to eliminate a potential safety hazard.

3.1.1 Facility Signs. - Signs to designate NASA facilities shall be limited to free-standing signs of the type shown in Figure 1. General dimensions of lettering and format of the sign shall follow those depicted in Figure 3 and shall not be modified without specific approval of the Engineering Development Directorate. The KSC Headquarters Building, on which lettering was mounted during construction, is an exception to this requirement.

3.1.2 Street Name Signs. - Street name signs are to be similar to those existing at KSC (see Figure 2) which are rectangular in shape. Street name sign assemblies shall be the "4-way" type. The sign head shall be mounted on the assemblies, slanted to the correct eye level for maximum readability. Sign head shall assemble and lock, at parallel, 45 or 90 degree positions to each other. Street name signs shall indicate the name identification of the street as shown on the currently approved Kennedy Space Center Master Plan.

3.1.3 Construction Contractor Signs. - Contractors and their major subcontractors may attach signs to their trailer or construction office for identification purposes. Such signs shall be limited to indicating the following information:

- (1) Contractor's name (maximum letter height: 4 inches)
- (2) Contractor's home office address (maximum letter height: 2 inches)
- (3) Contractor's local and home office phone (maximum letter height: 2 inches)

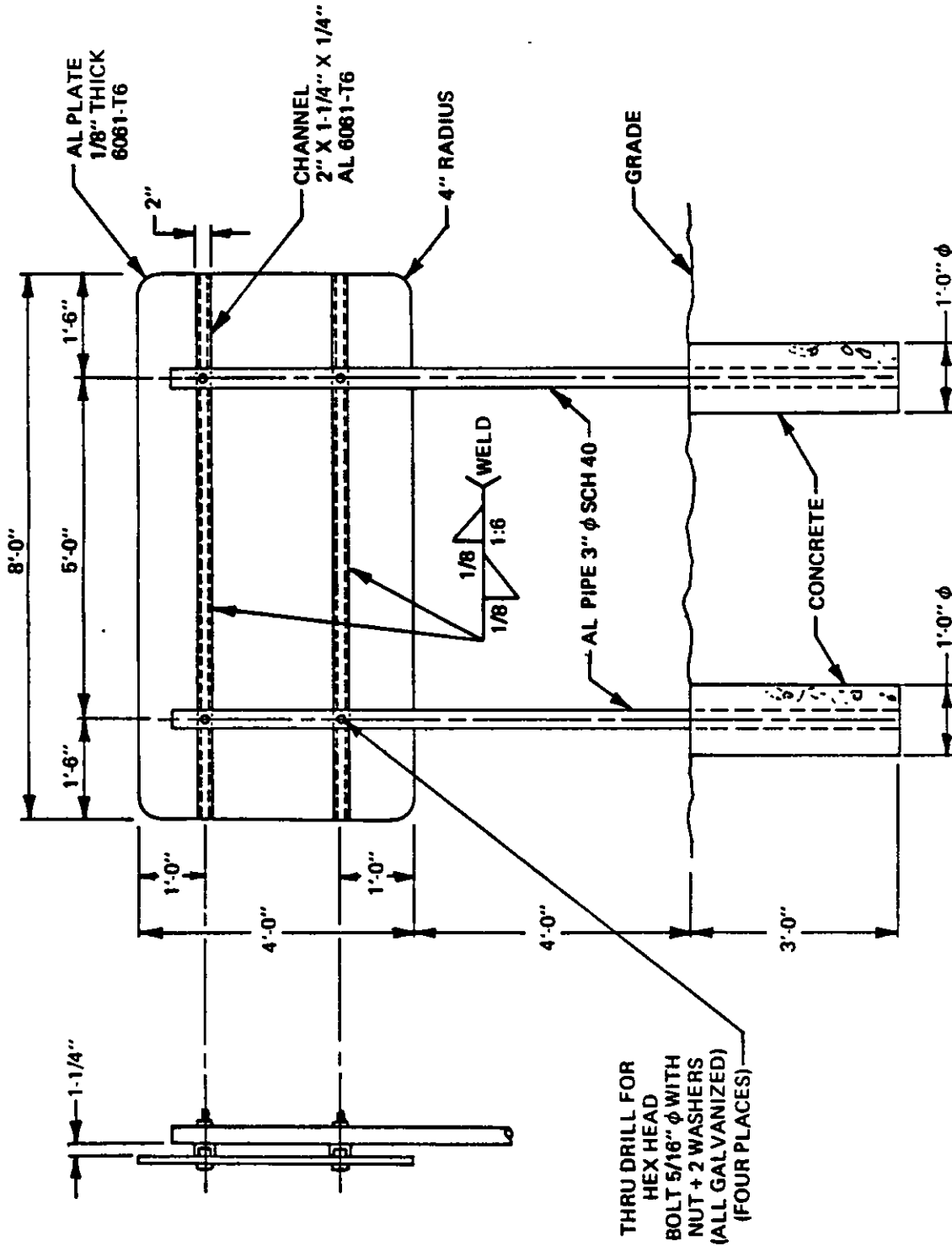


Figure 1. Facility Signs

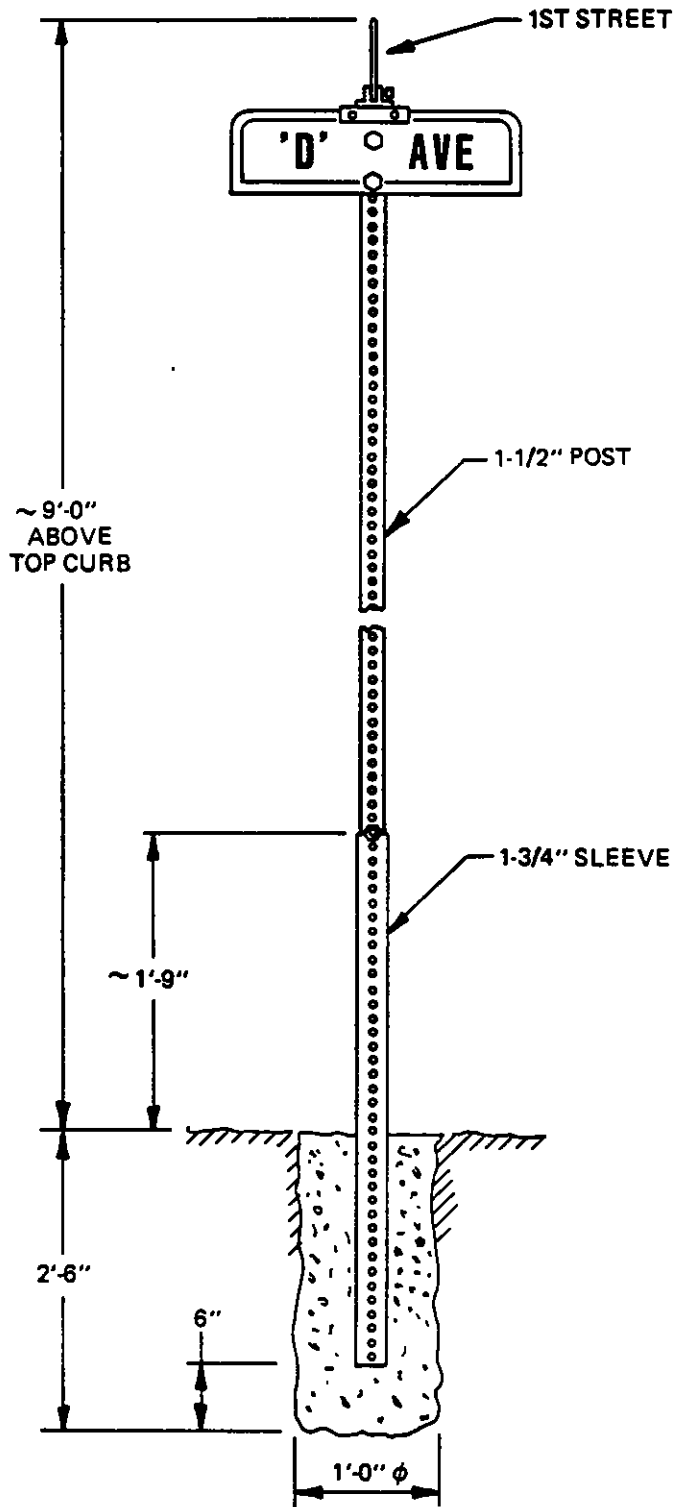


Figure 2. Street Name Signs

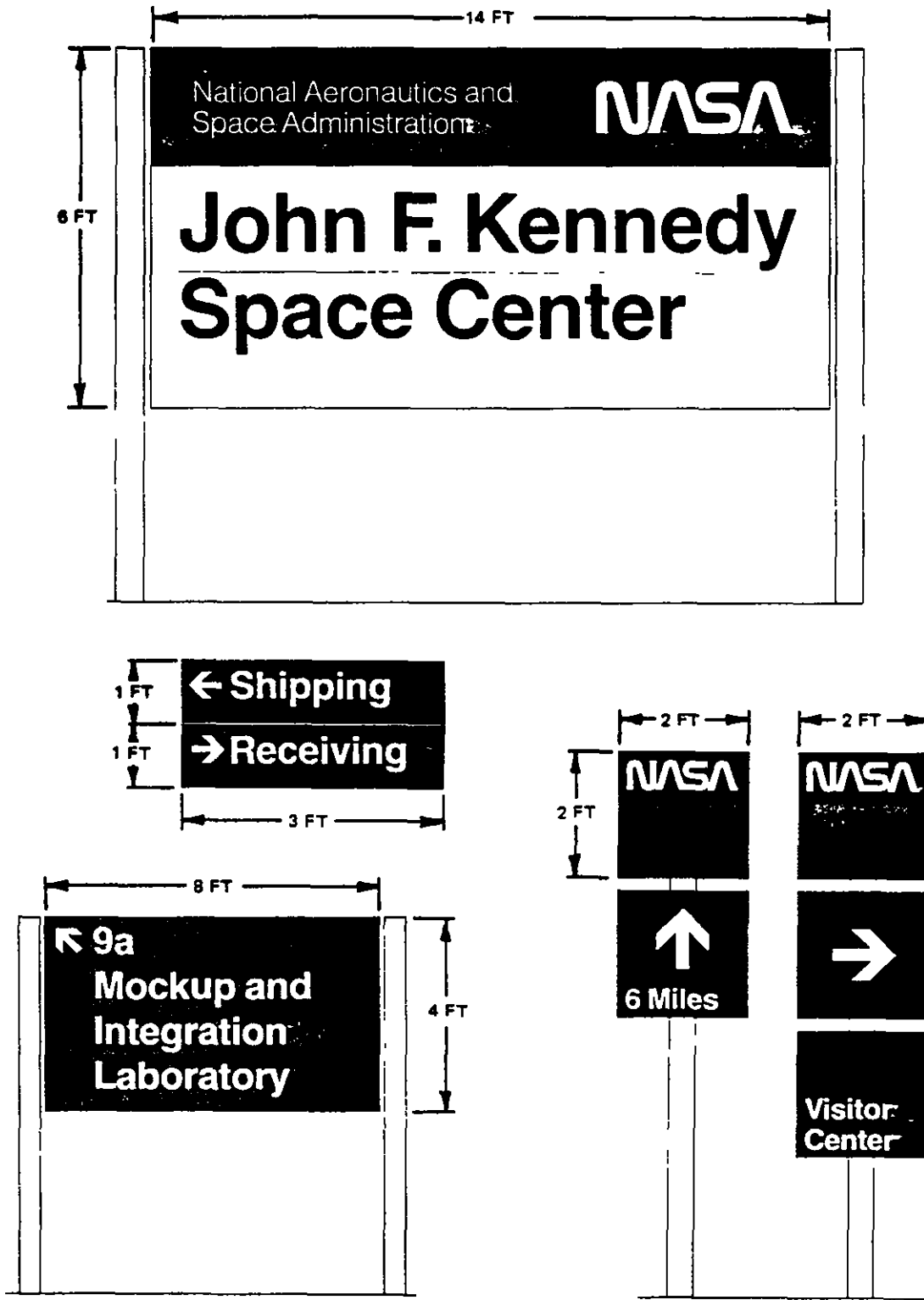


Figure 3. Format - Facility and Roadway Signs

- (4) A symbol, not more than 16 inches in its greatest dimension, may be included.

3.1.4 Traffic Control and Roadway Signs. - Traffic control signs shall be dimensioned, colored and positioned in accordance with the standard established by the U.S. Department of Transportation, Federal Highway Administration, in its "Manual on Uniform Traffic Control Devices for Streets and Highways," latest edition. The lettering and format for other roadway signs shall follow those depicted in Figure 3 and Figure 4.

Where optional markings are permitted, the standards of the Florida Department of Highways shall apply. Traffic control and roadway signs shall be installed or removed only by authority of the Director, Protective Services Office.

3.2 Materials. - Materials shall conform to the following:

3.2.1 Footing Materials.

- a. **Concrete.** - Concrete shall have a minimum allowable compressive strength at 28 days of 2,500 pounds per square inch (psi) and shall conform with the requirements of ACI 318.
- b. **Reinforcing Steel.** - Reinforcing steel, if required, shall conform to ASTM Standard A615.
- c. **Sleeves, Pipe.** - Pipe sleeves shall be galvanized steel or aluminum pipe similar to that used in the sign frame but sized to permit sliding fit of the frame supports. The specified sleeves must be compatible with the intended post to prevent galvanic decomposition.
- d. **Tie-Down Bolts.** - Tie-down or anchor bolts shall be galvanized steel "J" bolts of such length, diameter, and material to develop the resistance necessary to prevent overturning of the sign under 40 psf wind pressure. All materials in contact must be compatible to prevent galvanic decomposition.

3.2.2 Sign Materials.

3.2.2.1 Facility Signs.

- a. Frames, posts, and reinforcing members for signs shall be of drawn seamless or extruded aluminum tubing or structural shapes of the dimensions shown on the appropriate figures of this specification or galvanized structural steel of equivalent strength. Aluminum material for posts and frames shall be of 6061-T6 alloy conforming to ASTM Standard B210, B211 or B308; structural steel shall be carbon steel conforming to American Institute of Steel Construction Manual of Steel Construction.



Figure 4. Format - Roadway Signs

- b. Sign blanks or face sheets of plate shall be aluminum sheet alloy, type 5052, temper H32, conforming to ASTM Standard B209.
- c. Sign fasteners, including machine screws, nuts, bolts, and washers, for use with aluminum materials shall be fabricated from aluminum alloy type 2024 wire and rod conforming to ASTM Standard B211. The thread fit for bolt and machine screws shall conform to American Standards Association Class 2A and the thread fit for the nuts shall be Class 2B. Finished nuts, bolts, and machine screws shall be supplied in the T4 temper. Flat washers shall be made from aluminum alloy Alclad 2024-T (ASTM Standard B209). All nuts, bolts, screws and washers shall be finished in accordance with Military Specification MIL-A-8625, Type II, dichromate sealed.

Fasteners for signs made with steel shall be of similar material and finish. Neoprene washers used with the screws shall be of a carbon black filled formulation of the hardness ranging from 65 to 75 Shore A, having a minimum tensile strength of 1100 psi and a minimum elongation of 175 percent.

3.2.2.2 Street Name Signs.

- a. Sign posts and sleeves shall be 12 gauge square steel tubing conforming to ASTM Standard A446. All posts and sleeves shall be weather protected by galvanizing. Posts and sleeves shall be formed from cold rolled steel strip which has been zinc coated per ASTM Standard A525, coating designation G90. The sleeves shall be set in a concrete footing as specified in 3.2.1.
- b. Sign posts and sleeves shall be 1-1/2 in by 1-1/2 in and 1-3/4 in by 1-3/4 in, respectively, with 7/16 in perforations every inch on all sides.
- c. Sign brackets for square posts shall be aluminum alloy, 6061-T6, conforming to ASTM Standard B221.
- d. Sign plates or blanks to be 0.063 gauge aluminum sheet alloy, 6 in high. The length will vary with the street name.
- e. Hardware to fasten street name signs to posts and posts to the sleeves, shall conform to the following:

Machine bolt, corrosion resistant steel conforming to MS35307-340,

Plain hex nut, corrosion resistant steel conforming to MS51971-2,

Flat washer, zinc finished steel conforming to AN970-5

- f. Sign plates or blanks shall have a reflective sheeting background of the type specified in paragraph 3.2.2.4.b below.

3.2.2.3 Construction Contractor Signs. - Face of sign may be of wood or metal at the option of the contractor. The sign shall be constructed with true, square edges, small radian corners, and without cracks, loose knots or other defects in materials. They shall be erected in a workmanlike manner to support the sign properly for the life of the contract.

3.2.2.4 Traffic Control and Roadway Signs.

- a. Sign blanks shall be aluminum alloy 5052-H32 or 6061-T6, per ASTM Standard B209, 0.080 inches gauge.
- b. Flexible reflectorized sheeting shall meet the requirements of Federal Specification L-S-300 and shall consist of a reflective material bound to the sign blank through vacuum and infrared heat application. The precoated tack-free adhesive shall form a durable bond to the sign surface and shall, after 48 hours of aging (from the time of application) at 75°F, possess the following characteristics:
- strong enough to resist peeling from the application surface.
 - tough enough to resist scuffing and marking during normal handling
 - elastic enough at low temperature to resist shocking off when struck at 20°F
 - and moisture resistant enough to withstand eight hours of soaking in water at 75°F without appreciable decrease in adhesion

The precoated adhesive shall have no staining effect on the reflective sheeting and shall be mildew resistant.

- c. Reflectorized Sign Face. - Message and border shall be applied with materials and in the manner specified by the sheeting manufacturer.
- d. Sign posts, brackets, fittings, and fastenings shall meet the requirements specified hereinbefore for similar items. The size of post and requirements for its anchorage shall be based on size of sign.

3.2.2.5 Paint. Paint for structural steel parts of signs shall conform to KSC-STD-C-0001, "Protective Coating of Carbon Steel, Stainless Steel and Aluminum on Launch Structures and Ground Support Equipment, Standard For."

3.3 Fabrication. - Fabrication shall conform to the following.

3.3.1 Aluminum Castings and Extrusions. - All aluminum castings and extrusions shall be cleaned in accordance with good commercial practice.

3.3.2 Face Plates. - Aluminum face plates or blanks shall be prepared for flexible, reflectorized sheeting by degreasing with xylene and wiping clean. Caution: Xylene should be considered flammable and toxic by ingestion and inhalation. Reflective sign blanks shall be covered with wide angle flexible reflective sheeting complying with Paragraph 3.2.2.4.b. Color shall be as shown on the plans, applied as specified in Paragraph 3.2.2.4.c.

Aluminum, steel, or wood face plates for painted signs shall be prepared as recommended by the paint manufacturer.

3.3.3 Frame Joints. - Joints for structural steel or aluminum, either pipe or extruded, frames shall be welded. Welds shall be 3/16 inch fillet and/or squarebutt welds as necessary to provide a continuous water-tight connection on all exterior faces of the joint. The frames shall be mitered at corner joints. Welds shall be made with a suitable filler material. Welds shall be ground to a smooth contour.

3.3.4 Street Name Signs. - Street name signs shall have wide angle flexible reflective sheeting. The background color shall be green and the legend white, similar to the colors of existing signs at Kennedy Space Center.

3.3.5 Workmanship. - Sign frames, plates, and accessories shall be fabricated to the dimensions shown on the applicable figures subject to normal shop operation tolerances. Sign frames and plates shall be constructed square and true with erection bolt holes accurately drilled and tapped using templates or jigs which will ensure interchangeability of various components and easy field erection.

3.4 Erection. - Sign posts and frames shall be erected in accordance with the applicable figures and shall be set plumb and level. Sign posts shall be embedded in concrete footings of the dimensions shown on the applicable figures. Concrete shall be mixed and deposited in accordance with the requirements specified in ACI 318. The placement of reinforcing steel in the concrete shall also be as specified in ACI 318.

3.5 Finish. All aluminum alloy posts, frames, assemblies, and fasteners shall be finished in accordance with Military Specification MIL-A-8625, Type II, dichromate sealed. Steel elements shall be cleaned by sandblasting prior to painting with zinc rich inorganic paint as per KSC-STD-C-0001. The materials used for temporary signs shall be consistent with the economic and life expectancy requirements.

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3.6 Sign Locations. - The location of signs at Kennedy Space Center shall comply with KSC policy as outlined in KHB 1200.1A, Section 13.

3.7 NASA Logotype.

3.7.1 Logotype. - In the logotype, the letters in N-A-S-A are reduced to their most simplified form. The strokes are all of one width evoking the qualities of unity and technical precision. The logotype should never be altered or distorted in any way. It must not be re-drawn, but rather reproduced photographically from reproduction artwork. When the logotype is reduced or enlarged it must be done intact so the Agency identification, Center identification, and logo remain proportionately the same.

3.7.2 Agency and Center Identification. - The examples shown in Figure 5 illustrate standard configurations for NASA "Agency" and "Center" identification.

3.7.2.1 Agency Identification. - To identify the agency, as a total entity, the NASA logotype is shown in conjunction with the full agency name (National Aeronautics and Space Administration). The lettering type used in the agency name is Helvetica light, upper and lower case. The size (height) of the agency name should relate to the size of the logotype as indicated in Figure 5.

3.7.2.2 Center Identification. - To identify the NASA Center, the NASA logotype and full agency name is shown in conjunction with the full center name (John F. Kennedy Space Center). The lettering style used in the center name is Helvetica medium, upper and lower case as shown in Figure 5.

3.7.3 The NASA Logotype: Use of Color. - The following describes the various colors used for the NASA logotype and background.

3.7.3.1 White Background. - Against a white background the letters shall be NASA warm gray, NASA red or black. These colors may be used by themselves or in combination with one another, whichever most appropriately fits the situation. The NASA red color shall be similar to the following, which is per Federal Standard No. 595: #40011 (gloss), 40021 (semigloss), and 40031 (lusterless) series.

3.7.3.2 Very Light Background. - Against a very light background, the logotype should be shown in black.

3.7.3.3 Red, Black or Very Dark Background. - The logotype should always be shown in white against a background of NASA red, black, or very dark color background; it should never be shown in NASA red.

3.7.3.4 Medium Background. Against a medium background the logotype may be shown in either black or white, depending on which is more appropriate. The logotype should never be shown in NASA red against a medium background.

The NASA logo, consisting of the word "NASA" in a bold, sans-serif font. The letters are black and have a slightly irregular, hand-drawn appearance.

National Aeronautics and
Space Administration

The NASA logo, consisting of the word "NASA" in a bold, sans-serif font. The letters are black and have a slightly irregular, hand-drawn appearance.

National Aeronautics and
Space Administration

John F. Kennedy Space Center

Figure 5. Agency and Center Identification

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4. QUALITY ASSURANCE PROVISIONS

4.1 Inspections and Tests.

4.1.1 Fabrication. - The fabricator shall perform visual inspection, dimensional measurements and material verification to determine compliance with the requirements of Section 3 of this specification. Inspection and test procedures shall be those normally used for structural steel or aluminum and for painting except where more specific test procedures are required by referenced Federal, ASTM, or other standards.

4.1.2 Installation. - Sign location shall follow the guidelines established in KHB 1200.1A, Section 13. After installation is complete, the signs shall be inspected at night. If specular reflection is apparent on any sign, its positioning shall be adjusted to eliminate this condition.

5. PREPARATION FOR DELIVERY

Unless otherwise specified, the preservation and packaging, packing and marking of deliverable items shall be equivalent to the best commercial practice provided this practice will be sufficient to protect the product from damage during shipment.

6. NOTES

6.1 Intended Use. - This specification is intended to be used for the design, fabrication, and erection of facility, street, construction contractor, and traffic control signs fabricated after the effective date of this document.

NOTICE. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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